

STEREO MOC Status Report  
Time Period: 2017:121 - 2017:127

STEREO Ahead (STA) Status:

1. The following Ground System anomalies/events occurred during this reporting period:

- None.

2. The following spacecraft/instrument events occurred during this week. The Ahead observatory operated nominally during this week.

- On day 120 fine pointing was lost four times at 0703z, 1304z, 1603z, and 1904z and again on 121-0403z. These occurrences are associated with transients that occurred as pairs of wheels (wheels 3 & 4) passed through zero simultaneously. There was some ping-ponging of the wheels passing through zero that occurred at approximately the Speed Avoidance computation interval (3 hours) or multiples thereof. In total, there were 108 occurrences of the Fine Specs Met flag being zero on day 120 which is well within the 3-sigma jitter specification. These transients can occur with no gyro operations and are not indicative of any problem with the spacecraft G&C.
- The average daily science data return for Ahead was 6.2 Gbits during this week.

STEREO Behind (STB) Status:

1. Detailed status of the recovery activities this week to restore operations is listed below.

- None.

2. The Behind loss of communication anomaly occurred on October 1, 2014. Post superior solar conjunction, recovery operations resumed on November 30, 2015. By implementing the NASA Failure Review Board recommendations, the first recovery attempt began with carrier detection by the DSN on August 21<sup>st</sup>, through September 23, 2016. At a spacecraft range of ~2 AU, the observatory was found to be rotating slowly about its principal axis of inertia for which the uncontrolled attitude

allowed some solar array input and continuous uplink and downlink communications on the LGA at emergency data rates. Over the next 22 continuous days, significant obstacles to recovery were overcome with a collaborative effort of the JHU/APL engineering team, NASA GSFC, DSN, FDF, SSMO scheduling, and Mission Operations teams. This consisted of:

- Reliably commanding a rotating spacecraft with uncontrolled attitude at a distance of 2 AU
- How to power on the spacecraft that was never designed to be off without collapsing the battery voltage
- Acquiring telemetry at 35 bps from a spacecraft that is rotating with an uncontrolled attitude
- Warming a frozen propulsion subsystem with a degraded battery and limited solar array input with an uncontrolled attitude
- Configuring, loading, and verifying EA, C&DH, and G&C parameters and macros with very limited telemetry
- Conducting an autonomous momentum dump in the blind and transitioning to C&DH standby mode and successfully receiving telemetry on the HGA indicating star tracker lock and decreasing system momentum.

However, system momentum level remained above the threshold for re-establishing attitude control with the reaction wheels. Due to the uncontrolled attitude, communication degraded and the last detection of the carrier was on September 23<sup>rd</sup>.

Behind Observatory Status - From the last telemetry received on September 18<sup>th</sup> and the telemetry assessment review held on February 24<sup>th</sup>, main bus voltage is low, 3 out of 11 battery cells are bypassed, attitude remains uncontrolled, rotating about its principal axis of maximum moment of inertia. While likely all ~42 kg of hydrazine remains and is frozen, both pressure transducers are not functioning. EA mode is enabled and autonomy is disabled. The battery charge rate is C/10. RF is configured for the +Z LGA at emergency data rates and the range of the expected best lock frequency is known. Necessary macro sequences have been tested to allow the peak power tracker in C&DH standby mode to protect the battery. These macro sequences will be loaded to EEPROM when the communications supports longer commands.

Monthly recovery efforts consist of attempting to power on the transmitter for 30 minutes. If no carrier signal is detected, battery recovery operations will commence which consist of

repeatedly sweeping a 4 kHz uplink range and sending commands for IEM switched power and PDU 1553 interface bus off. The next recovery tracks will use the DSN uplink array capability on May 13<sup>th</sup> and 14<sup>th</sup>.

Recovery planning continues with weekly discussions to refine the plan and procedures for the next recovery attempt this Fall by incorporating recommendations from the BEHIND telemetry assessment review and lessons learned. The next recovery planning meeting is on Thursday, May 11<sup>th</sup> at 9 AM EDT.